Drug Production in Hospitals of Tropical Countries

A practical guide with formulas

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To the reader and user of this booklet

This booklet reflects experiences with drug production at hospital level in different countries. For more than 15 years the Infusion Units Project in Moshi, Tanzania, has been supporting more than 50 hospitals by training personnel and offering materials to manage local production of infusions. This project was funded by the Medical Mission Institute in Würzburg who are in close cooperation with the German Institute for Medical Mission, Tübingen, as far as different health activities in the south are concerned. One of the goals of the DIFÄM Pharmaceutical Aid Department is to look for possibilities of local drug production on different levels. Now DIFÄM received a request of the staff in Moshi to assist in a project for Decentralized Drug Production focusing on syrups, ointments and disinfectants. That happened just when the draft of this brochure was finalized. In close cooperation with Würzburg a pilot project was developed by the staff in Moshi together with Tübingen which took place in 2000. The results influenced this final version of the brochure.

We have done our best to ensure that the information given is correct and up to date at the moment of publishing this booklet. However, the editors cannot be held responsible for any error in this booklet nor for the consequences of such errors. If you have any criticism or comment that could be useful to improve this booklet, or if you find any errors, we would appreciate if you could let us know. The editors would like to encourage an interchange with the readers and users of this booklet. As the presented facts shall be updated at certain intervals, the editors are grateful for additions, observations and constructive reviews. Only with the integration of different experience levels is it possible to optimize this booklet.

If there should be problems in selecting and obtaining the required raw materials or the equipment needed, the German Institute for Medical Mission is willing to give advice or to look for possible solutions together with you.

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Contents

Introduction to this booklet

Many economically poor countries suffer a permanent undersupply of medicine. The wish to produce certain generic drugs locally so as to compensate this lack is often expressed. Existing infrastructure for the production of infusions, which presupposes know-how of sterile technology as a source of good quality water, may make additional production of generic eye-drops, solutions, suspensions, syrups, etc. possible. Since water is a major ingredient in many drugs, existing transportation problems and transportation costs are avoided or cut by local drug production.

The DIFÄM (German Institute for Medical Mission - Medical Aid Department) has often been requested to provide information on "easy-to-make" formulas. This booklet was created on the basis of such requests, discussions arising thereof, as well as impressions taken from personal journeys into some African countries.

We would like to emphasize that this booklet does not encourage local drug production if working supply structures with proprietary preparations in sufficient quality and price do already exist. Our purpose is to suggest or introduce a self-help method in conditions where the state of medical supply is difficult.

Most formulas introduced here are easily produced with simple methods and equipment. Nevertheless, some fundamental prerequisites which will be mentioned later have to be fulfilled.

It is not our primary intention to present a comprehensive or systematic booklet. Since the booklet itself is of simple nature and not to be compared with scientific publications, it is not to be expected that the preparations described are "high-tech-products".

A survey with people working in hospitals and dispensaries, primarily in Africa, preceded the creation of this booklet. Many reports showed that local drug production already exists in some hospitals. A fixed spectrum of drugs (solutions, mixtures, liquids, syrups, ointments, dermatological preparations, disinfectants and eye-drops) are produced already. A closer look at the quality of locally produced preparations showed that no standard formula was being followed. In other words, different concentrations of the active substances as well as differing ingredients or vehicles were often employed.

The aim of this booklet is to introduce simple but high quality variants of commonly-used formulas, bringing these into line with standards proposed by pharmaceutical literature (e.g. British Pharmacopoea BP, United States Pharmacopoea USP), wherein formulas are reduced to a few essential substances. Though continuity in the build-up of a text like this is necessary, the great scope of different sources made slight differences in the formulation of procedures inevitable.[1]

Although the manufacturing of infusions plays an important role in local production, it is not to be dealt with in this booklet. Eye-drop production will also not be given further notice here, since similar instructional material to this theme already exists[2]. Neither should the use of tropical plants or herbal medicine be of any concern in this booklet.[3]

A question frequently asked by people who intend to produce drugs locally is: "How essential is this drug?" Some substances and preparations mentioned in this booklet are not according to the "WHO - Essential Drug List". But these preparations are common in many hospitals and are used in big quantities. Their use is, however, intended as a relief for diseases not considered as a threat to life. Local production of these drugs will reduce costs involved (often hard currency) and enable the hospital manager to use this saved money for essential drugs.

Sometimes we present alternative preparations for the same indication - we want to offer the possibility to follow the local preferences in different countries.

[1] All texts concerning dermatological preparations were taken from the excellent book "Dermatological preparations for the tropics", by Peter Bakker et al, ISBN 90-367-0225-9.

[2] For more information on the production of eye-drops we recommend the booklet entitled "The local small-scale preparation of eye-drops", published by World Health Organization, Programme for the Prevention of Blindness, WHO/PBL/90.20.

[3] Many interesting formulas for the production of simple soaps, medicinal oils and ointments as well as instructions concerning the use of herbal medicine can be found in the book "Natural Medicine in the Tropics", written by Dr. Hans Martin Hirt and Bindanda M'Pia, Action for Nature and Medicine (ANAMED), Schafweide 77, D-71364 Winnenden / Germany.

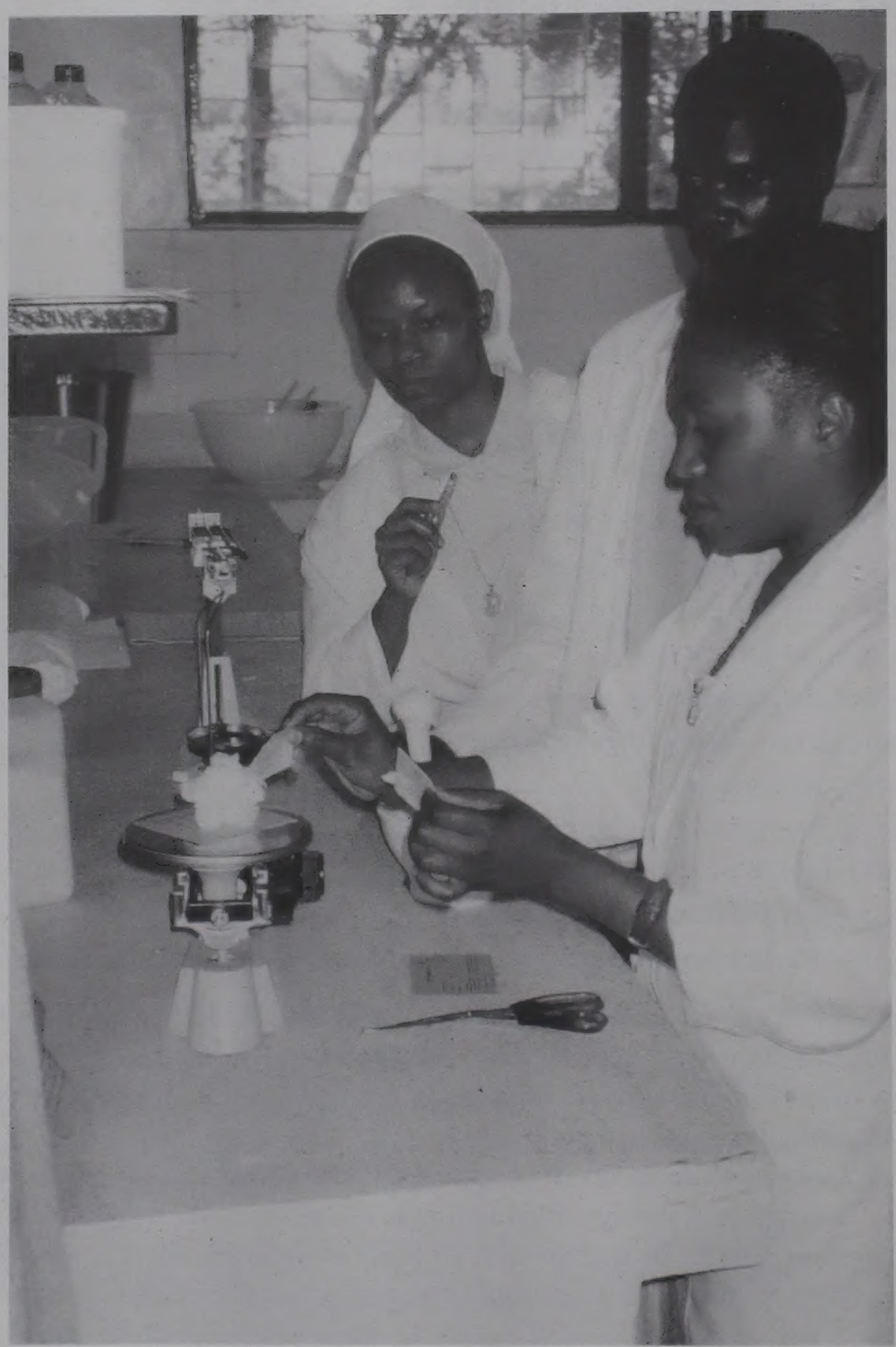
Prequisites for local drug production

1. Local drug production should be sanctioned by the responsible health authorities (that means in most African countries the Pharmacy Board).
2. Drugs should be produced under the supervision of pharmaceutically trained personnel. Production by qualified personnel who are trained for their respective tasks is indispensible.

Important aspects in the training of production personnel are:

- GMP (Good Manufacturing Practice)-guidelines which are set by WHO, these include requirements for personnel, production rooms, equipment, quality assurance and quality control
- basic pharmaceutical methods like weighing, measuring of liquids, grinding, sieving, mixing, filtering, heating, and sterilizing
- basic skills in pharmaceutical calculation
- basic skills in compounding techniques
- hygienic production and basic knowledge of microbiology, especially under tropical conditions
- basic skills in drug preservation
- basic skills in packaging, storing, and shelf-life of produced drugs
- vigilant documentation during production
- quality assurance and control
- knowledge of characteristics of drugs produced, i.e. reactions, limitation of use, side effects, interactions and dosage of the produced drugs
- ability to give correct information to patients
- organization of store-keeping and retrieval of raw materials, containers and labels.

3. Compounding sections must be sufficient in size and must allow to do the work undisturbed. The storage of raw materials, containers, equipment and produced drugs should also be separated from other departments. Compounding sections and the stock areas should be kept clean on high hygienic standards.
4. Basic equipment is dependent on the spectrum and quantity of drugs which are to be manufactured. Cleaning and storage must be made possible under hygienic conditions.
5. Supply of all materials should be guaranteed, so that the drug producers can work properly.
6. A formulary is necessary showing procedures for quality assurance and quality control.



Quality assurance and quality control

Every pharmaceutical production should include methods of quality assurance and quality control. In Germany and many other industrial countries strict measures for quality control are prescribed by law. Beginning with control of raw materials (identity, purity, content tests) moving on to in-process-controls in the case of large batch production, up to analytic control of finished drugs. In all cases, complex tools for chemical testing and analytic equipment are needed. Control of that kind should be carried out only by properly trained personnel.

What should be done if the infrastructure for pharmaceutical quality control is missing?

If production volume rises, a laboratory equipped with adequate instruments for conducting basic examinations becomes indispensible. Personnel trained specifically for the task of quality control also has to be available.

If production is intended for smaller hospitals/health centres, the editors recommend to have regular external quality controls as far as possible; e.g. by sending samples to regional or national institutions that possess appropriate analytic possibilities.

If such possibilities do not exist in the country you are working in, the editors will try to support you in finding ways for a periodic quality control.

A very important principle for the production of drugs is:

Quality has to be put into a drug,
it cannot be examined into it.

According to this principle, it is important to obey strictly the following criteria. These describe the lowest but also the most important steps for quality assurance while producing the drugs:

1. Only raw materials of secured quality are to be used. If you cannot inspect the raw materials yourself, it is strongly advised to obtain these from suppliers who can guarantee perfect quality. Furthermore, a certificate of analysis for every raw material should be demanded.
2. All equipment used for production has to be in perfect condition and must function properly. This is especially important for used scales which have to cover the required range. The exact functioning of scales should be inspected regularly.

Do not use raw materials of unknown origin or wich are not labelled sufficiently

Do only produce drugs yourself if you have correctly functioning scales at your disposal

3. People involved in the production should pay attention to indisputable personal hygiene, especially by handwashing before beginning to work. Direct contact of your hands with raw materials or drugs during production should be avoided. Personnel with acute infectious diseases are not allowed to produce drugs.
4. Adequate preservation is essential for the shelf life of many drugs and therefore should not be omitted in any case.
5. A simple but effective possibility of quality assurance is the control of accurate use of the raw materials and of all calculations of weighing and measuring by a second competent person.
6. Never mix the fresh preparation with "older" ones.

Production rooms and tools have to be kept meticulously clean

7. The packaging is important for the quality of the dispensed drugs. Wherever possible, locally produced drugs should be filled directly into clean containers and be dispensed in these original containers brought by patients themselves should only be seen as a temporary solution. It has to be made absolutely sure that the containers are clean, tightly closed and do not interfere with the contained drugs.
8. Each drug production has to be recorded. Best would be to use standard forms on which at least the used raw materials including details of the producer and the batches, the quantity to be weighed of each raw material and the actual weighing quantity as well as the signature of the producer and the date of the manufacture are noted.
9. Each dispensed drug has to be labeled clearly and durable with at least the following specifications:

There should be periodic validation of production equipment and procedures by a qualified person

- name of the active substances
- quantity of the active substances/volume unit
- date of manufacture
- period of the shelf life / expiry date
- dose and instructions for use
- warnings in cases of toxic or hazardous preparations.

1. Liquid Oral Dosage Forms

Preliminary notes

Liquid oral dosage forms are especially **suitable for children** as the dosage can be measured according to their body weight and are swallowed more easily. They are also better accepted by children because of their mostly high content of sugar and because of the possibility of improving their taste by using flavours. However, whenever possible solid unit dosage forms (e.g. tablets, capsules) of the following liquid drugs should be preferred - at least for adults (reasons: higher exactness of dosage, better durability and packaging).

Basically, production and dispensing of preparations marked with "*" **are more complicated** because their active substances are hardly or not at all soluble. These suspensions should only be bottled and dispensed if they are homogeneous, which means that the substances are well mixed together. For the production of these preparations a simple stirring machine is recommended.

These Suspensions should be dispensed only if the sediment of the solids can be redispersed completely and if the preparation will be used soon. Therefore, there are limitations for the dispensing to outpatients. The label should indicate the following: "Shake well before use!" This should also be explained sufficiently to the patient.

We do **advice not to make suspensions from solid oral dosage forms e.g. crashed tablets, crashed coated tablets or capsules**, as it is not possible to make sure that the quality and stability of such a suspension is in order. This is so because the particle size of the crashed solid oral dosage forms can be within a wide range, and for a good quality suspension it is necessary to use only powders with a small range of particle sizes. Otherwise there is a big risk of getting a product which is not homogeneous after shaking and which cannot be administered in the correct dosage. Another reason is the instability of some active substances (like amoxicillin) in aqueous solutions or suspensions.

In this part of the booklet we do not give any information concerning the **specific pharmacological aspects** (e.g. adverse effects) of the active substances of the preparations, but we give information concerning the dosage of each preparation.

The dosages in this booklet always refer to the active substances and the quantity of the administered preparation. The dosages of the active substances are taken from "Martindale - The Extra Pharmacopoea, 32.Edition".

The following **quantity details are exemplary**, and therefore they have to be fitted to the individual needs. Please note that liquid drugs should not be kept in large stock because of their limited shelf life. The use-up-time for all listed preparations in this part of the booklet should not exceed 1 month from the manufacturing date. If there are extreme climatic conditions, even this period could be too long. Therefore, take good care to avoid possible mould, dulling of the solution and changing of the taste. If any of these occur, discard the preparation.

For the production of the below mentioned preparations the water used has to be freshly boiled and immediately used after cooling

Water is the main vehicle of all liquid oral dosage forms. A good quality of the water used is the prerequisite for the quality of the preparation produced.

"Purified water" means for example water prepared by reverse osmosis, distillation, treatment with ion exchange materials, or by filtration. If the procedures are not practicable locally, liquid oral dosage forms should only be produced if water is available in tap water quality (free of germs, dirt and chemical contaminants) with a low degree of hardness.

"Preserved water" is made by adding preservatives so that the water is protected against germs and spoiling.

! Note:

When in the formula is written "... to ...ml" or "... to ...g", you have to add this ingredient up to the final volume or final weight that is written there.

1.1. Basic Solutions

Preliminary remark: "Filter" means to filter through gauze or a clean piece of cloth.

1.1.1. Preserved Water

Formulation →

propyl-4-hydroxybenzoate	0,25g
methyl-4-hydroxybenzoate	0,75g
water	to 1000ml

Procedure:
1. Dissolve both substances in hot water.
2. Add water to the cooled-down solution up to the required volume.

! Precaution:
Hydroxybenzoate preservatives (parabens) may cause hypersensitivity reactions.

1.1.2. Syrup

Formulation →

a) weight:	
sucrose (white sugar)	667g
preserved water	to 1000g
b) volume:	
sucrose (white sugar)	850g
preserved water	to 1000ml

! Note:
Only refined white sugar should be used. Non-refined brownish sugar has some impurities that will affect the quality of the product.

Procedure:
1. Heat the preserved water to approx. 50°C and add this water to the sucrose. Stir thoroughly until the sucrose is dissolved.
2. Boil the solution shortly.
3. Filter and add recently prepared preserved water up to the required volume.

1.1.3. Basic Solution for Suspension

carboxymethylcellulose-sodium	14,7g
glycerol	80ml
preserved water	to 1000ml

← Formulation

Procedure:
1. Mix approx. 900ml of the preserved water and glycerol.
2. Heat this mixture to boil.
3. Spread carboxymethylcellulose-sodium in small parts over this hot mixture. Stir often to dissolve!
4. Add preserved water to the cooled-down mixture to produce the required volume.
5. Mix the solution and filter through gauze.

1.1.4. Flavouring Solution

peppermint oil	0,5ml
ethanol 96%	7,5ml
syrup	200ml
preserved water	to 1000ml

Formulation
(a) ← → (b)

strawberry-flavour	50ml
syrup	to 1000ml

Procedure a):
1. Dissolve the peppermint oil in the ethanol.
2. Mix the syrup and 150ml of preserved water.
3. Add the peppermint oil-in-ethanol-solution to this mixture while stirring.
4. Add the preserved water up to 1000ml.
5. Mix and filter.

Procedure b):
1. Add syrup to the strawberry-flavour up to 1000ml.
2. Mix and filter.

As an alternative to strawberry flavour, other flavours (like raspberry or cherry) can be used. It is possible to change the intensity of the flavour by varying the flavour proportion.

1.2. Preparations Containing Active Substances

1.2.1. Ammonium Chloride Mixture 500mg/5ml

Formulation →

ammonium chloride	100,0g
aromatic ammonia solution	50ml
liquorice liquid extract	100ml
preserved water	to 1000ml

Procedure:
1. Dissolve the ammonium chloride in approx. 500ml of the preserved water.
2. Add aromatic ammonia solution and liquorice liquid extract to the above solution.
3. Add preserved water up to 1000ml.
4. Mix and filter.

Indication: as an expectorant.

Dosage:
Adults: 10ml taken every 6 to 8 hours for several days
Children: 2ml to 5ml (depending on age) taken every 6 to 8 hours for several days

1.2.2. Antacidum Suspension

Formulation →

magnesium trisilicate	50,0g
aluminium hydroxide	24,0g
syrup	200ml
basic solution for suspension	420ml
preserved water	to 1000ml

If a better taste is wanted, it is recommended to replace syrup by flavouring solution (a).

Procedure:
1. Triturate carefully the magnesium trisilicate and the aluminum hydroxide with small parts of the basic solution for suspension in the mortar up to the full amount of the basic solution.
2. Add the syrup in small parts while stirring continuously.
3. Add preserved water up to 1000ml while stirring continuously.
4. Bottle the ready-made homogeneous suspension while stirring continuously.

➔ Do not filter!
For dispensing and use:
Dispense or use only a completely redispersed and homogeneous suspension. The label has to indicate: "Shake well before use!".

Indications: As an antacid.

Dosage:
Adults: 10ml every 8 - 12 hours 1/2 to 1 hour after meals. The daily maximal dose is 40ml.

Alternative for Antacidum Suspension:

1.2.3. Magnesium Trisilicate Mixture

magnesium trisilicate	50,0g
light magnesium carbonate	50,0g
sodium bicarbonate	50,0g
flavouring solution (a)	to 1000ml

← Formulation

Procedure:

1. Dissolve the sodium bicarbonate in approx. 500 ml of the flavouring solution (a).
2. Use this solution of sodium bicarbonate in small parts to triturate carefully the magnesium trisilicate and the light magnesium carbonate in a mortar.
3. Add the flavouring solution (a) slowly up to the required volume while stirring continuously.
4. Bottle the ready-made homogeneous suspension while stirring continuously.

➔ Do not filter!

For dispensing and use:
Dispense or use only a completely redispersed and homogeneous suspension.
The label has to indicate: "Shake well before use!".

Indication: As an antacid.
Dosage: Adults: 10 - 15ml 1/2 to 1 hour after meals.

1.2.4. Chloral Hydrate Mixture for Adults 500mg /5ml

Because of the bad taste it is recommended to replace the syrup by flavouring solution (b).

Formulation →

chloral hydrate	100,0g
syrup or flavouring solution (b)	200ml
preserved water	to 1000ml

Procedure:
1. Dissolve the chloral hydrate in approx. 200ml of the preserved water.
2. Add the syrup or flavouring solution (b) and mix.
3. Add the preserved water up to 1000ml.
4. Mix and filter.

Indications: As a sedative and as a hypnotic.

Dosage:

As a sedative: 2,5ml (= 250mg chloral hydrate) taken every 8 hours, to a maximum single or daily dose of 20ml (= 2,0g chloral hydrate), taken diluted with plenty of water or milk.

As a hypnotic: 5ml-20ml (= 0,5g-2,0g chloral hydrate) at night diluted with plenty of water or milk.
A reduction in dosage may be appropriate in frail elderly patients.

1.2.5 Paediatric Chloral Hydrate Syrup 200 mg/5ml

Formulation →

chloral hydrate	40,0g
flavouring solution (b)	400ml
preserved water	20ml
syrup	to 1000ml

Procedure:
1. Dissolve the chloral hydrate in the preserved water.
2. Add the flavouring solution (b) and mix.
3. Add the syrup up to the required volume.
4. Mix and filter.
5. Indications:

As a sedative and as a hypnotic.

Dosage:
As a sedative for premedication: 0,6ml-1,25 ml (= 25mg-50mg chloral hydrate) per kg body-weight, diluted with plenty of water or milk.

As a hypnotic: 0,75ml-1,25ml (= 30mg-50mg chloral hydrate) per kg body-weight at night, diluted with plenty of water or milk.

Maximum single dose: 25ml = 1,0g chloral hydrate.

1.2.6. Chloroquine Phosphate Syrup 80 mg chloroquine phosphate/5ml=50 mg chloroquine base/5ml

For a better taste preserved water can be replaced by flavouring solution (a) or (b) .

chloroquine phosphate	16,0g
citric acid monohydrate	5,0g
sodium chloride	4,0g
preserved water	100ml
syrup	to 1000ml

← Formulation

Procedure:
1. Dissolve the citric acid and the sodium chloride in the preserved water.
2. Add and dissolve the chloroquine phosphate.
3. Add the syrup.
4. Mix and filter.

Indication: Treatment of malaria, if the strain is not chloroquine resistant.

Dosage: Adults and children:
Total dosage: 25mg chloroquine base per kg body-weight distributed over 3 days, that means:
- 1ml chloroquine phosphate syrup (= 10mg chloroquine base) per kg body-weight taken every 24 hours for 2 days.
- 0,5ml chloroquine phosphate syrup (= 5mg chloroquine base) per kg body-weight taken once at day 3.

1.2.7. Cotrimoxazole Suspension 200mg + 40mg/5ml

Formulation →

sulfamethoxazole	40,0g
trimethoprim	8,0g
propylene glycol	100ml
basic solution for suspension	500ml
syrup	300ml
preserved water	to 1000ml

Procedure:

1. Triturate carefully and dilute the sulfamethoxazole and trimethoprim with small parts of the propylene glycol.
2. Mix the basic solution for suspension with the syrup (mixture 2).
3. Add small quantities of mixture 2 to the sulfamethoxazole / trimethoprim / propylene glycol-suspension while stirring until you get a fine and homogeneous suspension.
4. Transfer to a measuring jug.
5. Add the preserved water up to the required volume and mix carefully.
6. Bottle the ready-made homogeneous suspension while stirring continuously.

➔ Do not filter!

For dispensing and use:
Dispense or use only a completely redispersed and homogeneous suspension.
The label has to indicate: "Shake well before use!".

Indications:
Infections caused by susceptible organisms, particularly those of the urinary, respiratory, and gastro-intestinal tract. Pneumocystis carinii pneumonia, toxoplasmosis, and nocardiosis.

Dosage taken every 12 hours:

Adults:	usually	20ml	(= cotrimoxazole 960mg)
Children:	6 weeks to 5 months:	2,5ml	(= cotrimoxazole 120mg)
	6 months to 5 years:	5ml	(= cotrimoxazole 240mg)
	6 to 12 years:	10ml	(= cotrimoxazole 480mg)

!Note: Cotrimoxazole should not be given to infants below 6 weeks of age because of the risk of kernicterus from the sulphonamide component.

1.2.8. Dextramethorphan Hydrobromide Mixture 15mg/5ml

dextromethorphan hydrobromide	3,0g
syrup	500ml
preseved water	to 1000ml

← Formulation

Procedure:
1. Dissolve the dextromethorphan hydrobromide in approx. 200 ml of the preserved water (mixture 1).
2. Stir mixture 1 in the 500 ml syrup.
3. Add the preserved water up to 1000 ml.
4. Mix and filter.

Indication:
Treatment of dry cough with strong irritation of the throat.

Dosage taken every 6 to 8 hours:

Adults:		10ml	(= 30mg dextromethorphan hydrobromide)
Children:	2 - 6 years:	2,5ml	(= 7,5mg dextromethorphan hydrobromide)
	7 - 12 years:	5ml	(= 15mg dextromethorphan hydrobromide)

1.2.9. Ferrous Sulphate Mixture for Adults 200mg Fe (II) Sulphate Heptahydrate/5ml = 40mg Elemental Iron/5ml

ferrous sulphate heptahydrate	40,0g
citric acid monohydrate	2,1g
syrup or flavouring solution (b)	200ml
preserved water	to 1000ml

← Formulation

Because of the metallic aftertaste it is recommended to replace the syrup by flavouring solution (b).

Procedure:
1. Dissolve the ferrous sulphate and the citric acid in approx. 500ml of the preserved water.
2. Add the syrup or flavouring solution (b) and mix.
3. Add preserved water up to 1000ml.
4. Mix and filter.

Indications: Treatment and prevention of iron deficiency anaemias.
Dosage:
Treatment: 4ml–8ml ferrous sulphate mixture for adults every 8 hours = a total of 100–200mg elemental iron (= 500–1000mg ferrous sulphate heptahydrate) divided equally three times a day.

Prevention: 7,5–15ml ferrous sulphate mixture for adults once a day = 60–120mg elemental iron (= 300–600mg ferrous sulphate heptahydrate) once a day.

1.2.10. Paediatric Ferrous Sulphate Mixture 60mg Ferrous (II) Sulphate/5ml = 12mg Elemental Iron/5ml

Formulation →

ferrous sulphate heptahydrate	12,0g
citric acid monohydrate	2,1g
flavouring solution (b)	300ml
syrup	to 1000ml

Procedure:
Like "ferrous sulphate mixture for adults".

Indications:
Treatment and prevention of iron deficiency anaemias.

Dosage:
Treatment Children:
Up to 0,8ml paediatric ferrous sulphate mixture per kg body-weight every 8 hours = up to 2mg elemental iron (= up to 10mg ferrous sulphate heptahydrate) per kg body-weight taken every 8 hours.

Prevention Children:
0,4ml paediatric ferrous sulphate mixture per kg body-weight once a day = 1mg elemental iron (= 5mg ferrous sulphate heptahydrate) per kg body-weight once a day.

1.2.11. Paedriatric Paracetamol Syrup 125mg /5ml

paracetamol	25,0g
propylene glycol	250ml
syrup	450ml
preserved water	to 1000ml

← Formulation

Procedure:
1. Dissolve the paracetamol in the propylene glycol.
2. Add the syrup and mix.
3. Add the preserved water up to the required volume.
4. Mix and filter.

Indications:
As an analgesic and antipyretic.

Dosage:

Children: Up to 3 months:	0,4ml	(= 10mg paracetamol)/kg body-weight
	reduce to 0,2ml	(= 5mg paracetamol)/kg body-weight if jaundiced
3 months to 1 year:	2,4ml–4,8ml	(= 60mg–120mg paracetamol)
1–5 years:	4,8ml– 10ml	(=120mg–250mg paracetamol)
6–12 years:	10ml– 20ml	(=250mg–500mg paracetamol)

These doses may be given every 4 to 6 hours when necessary up to a maximum of 4 doses in 24 hours.

1.2.12. Piperazine Citrate Syrup 937,5mg/5ml

piperacine citrate	187,5g
syrup	500ml
preserved water	to 1000ml

← Formulation

Procedure:
1. Dissolve the piperazine citrate in approx. 200ml of the preserved water.
2. Add the syrup and mix.
3. Add preserved water up to 1000 ml.
4. Mix and filter.

Indications: As an anthelmintic against roundworms and threadworms.

Dosage given once daily:
Treatment against threadworms:

age:	dose:	
1 - 3 years	5ml	(= 0,93g piperazine citrate)
4 - 6 years	7,5ml	(= 1,4 g piperazine citrate)
7 - 12 years	10ml	(= 1,87g piperazine citrate)
over 12 years	15ml	(= 2,81g piperazine citrate)

The daily dose is generally given for 7 days.

Treatment against roundworms:

1 - 3 years	10ml	(= 1,87g piperazine citrate)
4 - 5 years	15ml	(= 2,81g piperazine citrate)
6 - 8 years	20ml	(= 3,75g piperazine citrate)
9 - 12 years	25ml	(= 4,69g piperazine citrate)
over 12 years	30ml	(= 5,62g piperazine citrate)

A single dose with the evening meal is usually sufficient.

1.2.13. Promethazine Hydrochloride Mixture 5mg/5ml

Formulation →

promethazine hydrochloride	1,0g
ascorbic acid	1,6g
citric acid monohydrate	18,0g
syrup	500ml
preserved water	to 1000ml

Procedure:
1. Dissolve the promethazine hydrochloride, the ascorbic acid and the citric acid monohydrate in approx 500ml of the preserved water.
2. Add the syrup and mix.
3. Add the preserved water up to 1000ml.
4. Mix and filter.

Indications: As an antihistamine and sedative.

Dosage:
Antihistamine (for the symptomatic relief of allergic conditions and in pruritic skin disorders):

Children:	2 – 5 years:	5ml - 15ml	(= 5mg – 15mg promethazine hydrochloride) daily in one or two divided doses
	5 -10 years:	10ml - 25ml	(=10mg - 25mg promethazine hydrochloride) daily in one or two divided doses.

For night sedation:

Children:	2 - 5 years:	15ml – 20ml	(= 15mg - 20mg promethazine hydrochloride)
	5 - 10 years:	20ml – 25ml	(= 20mg - 25mg promethazine hydrochloride)

Alternative for Promethazine hydrochloride mixture:

1.2.14. Diphenhydramine Hydrochloride Mixture 12,5mg/5ml

diphenhydramine hydrochloride	2,5g
citric acid monohydrate	5,0g
syrup	200ml
preserved water	to 1000ml

← Formulation

Procedure:

1. Dissolve the diphenhydramine hydrochloride and the citric acid monohydrate in approx. 500 ml of the preserved water.
2. Add the syrup and mix.
3. Add the preserved water up to 1000 ml.
4. Mix and filter.

Indications: As an antihistamine and sedative.

Dosage: Children up to 12 years:

2,5ml - 10ml	(= 6,25mg - 25mg diphenhydramine hydrochloride) every 6 – 8 hours
or a total daily dose of 2ml	(= 5mg diphenhydramine hydrochloride) per kg body-weight may be given in divided doses. The maximum dose is 120ml (= 300mg daily).

1.2.15. Quinine Dihydrochloride Mixture
61mg quinine dihydrochloride/5ml = approx. 50mg quinine base/5ml

Formulation →

quinine dihydrochloride	12,2g
preserved water	200ml
syrup or flavouring solution (b)	to 1000ml

Because of the extremely bitter taste it is recommended to replace the syrup by flavouring solution (b) (possibly increase the flavour proportion!)

Procedure:
1. Dissolve the quinine dihydrochloride in the preserved water.
2. Add the syrup or flavouring solution (b).
3. Mix and filter.
4. Store in a dark glass or opaque plastic bottle, with a well fitting lid.

Indication:
Treatment of severe malaria caused by chloroquine- or multi-resistant strains of Plasmodium falciparum.

Dosage:
Children: 0,82ml (= 10mg quinine dihydrochloride) per kg body-weight every 8 hours.

A course of treatment for falciparum malaria usually lasts 7 days.

2. Dermatological Preparations

Preliminary remark: "Melt over gentle heat " always means: Heat in a waterbath – never heat directly on a heating source like a top-heater. Otherwise there is great risk to overheat the raw materials.

2.1. Basic Cream

Formulation →

lanette wax	15,0g
liquid paraffin	12,5g
petrolatum	22,5g
methylparaben	0,15g
water	to 100,0g

Procedure:

1. Mix together lanette wax, liquid paraffin and petrolatum and melt over gentle heat.
2. Heat this mixture to approx. 70°C.
3. Heat sufficient water to the boil. Dissolve the methylparaben in 50ml of this boiling water. Allow the rest of the boiled water to cool.
4. Allow the methylparaben solution to cool to approx. 70°C.
5. Mix this solution into the fat mixture 1.) at a temperature of approx. 70°C.
6. Stir until cold.
7. Add enough recently boiled and cooled water to produce 100 grams of cream. Stir until completely homogeneous.

The cream should preferably be used within 3 months.
Basic cream may get inhomogeneous at a temperature of 40°C and above. Inhomogeneity does not affect the cream, provided that it is properly mixed before dispensing or use.

Use:
Basic cream is used as a vehicle for a number of active ingredients. It has a relatively high fat content. The cream is easily washed away with water, and therefore it is suitable for use on hairy parts of the skin. Basic cream is not very occlusive, it may even have a slight drying effect on the skin.

2.2. Benzylbenzoate Emulsion

benzylbenzoate	25,0g
lanette wax	2,0g
water	to 100 ml

← Formulation

Procedure:

1. Heat 100ml of water to the boil and allow to cool to approx. 70°C. Use this water for the preparation.
2. Mix together the benzylbenzoate and the lanette wax, melt over gentle heat and warm up to approx. 70°C.
3. Add 70ml of the water of 70°C to this mixture.
4. Stir gently until cold.
5. Add enough recently boiled and cooled water to produce 100ml of emulsion and stir well.

The emulsion may separate during storage. It should therefore always be shaken before dispensing or use. Benzylbenzoate emulsion should preferably be used within 3 months.

Indications:
Benzylbenzoate emulsion is used for the treatment of scabies and lice, esp. in pregnant women and children under 3 years.

Instruction for use:
Shake the bottle before use.
Scabies: In the evening, take a hot bath and scrub the skin to open the burrows. Apply the emulsion from neck down to the whole body, including skin folds. Wash hands after application. 12 hours thereafter (the following morning) apply the emulsion a second time. 12 hours after the second and last application wash the body thoroughly with water and soap.
Lice: Rub the emulsion into all infected hairy areas, and leave there for 24 hours. Wash off thoroughly and comb the hair with a fine comb to remove dead lice. Repeat treatment twice at weekly intervals.

! Precaution:

Avoid contact of benzylbenzoate emulsion with the eyes.

2.3. Calamine Lotion (modified)

Formulation →

zinc oxide	20,0g
bentonite	3,0g
trisodium citrate	0,5g
glycerol	5ml
liquefied phenol	0,5ml
water	to 100ml

Procedure:

1. Heat 100 ml of water to the boil and allow to cool. Use this water for the preparation of the lotion.
2. Dissolve the trisodium citrate in 70ml of the water.
3. If sieves are available, sieve the zinc oxide, preferably through a 90µm sieve.
4. Mix the zinc oxide with the bentonite.
5. Triturate this zinc oxide/bentonite mixture with the glycerol and 20ml of the citrate solution.
6. Add the rest of the citrate solution and stir until completely homogeneous.
7. Add the liquefied phenol (be careful: corrosive!) and mix.
8. Add enough recently boiled and cooled water to produce 100ml and mix well.

Calamine lotion should preferably be used within 3 months.
Calamine lotion may separate during storage. It should always be shaken before dispensing or use. The label has to indicate: "Shake well before use!"

Indications:
Calamine lotion has general soothing, cooling, antiseptic and antipruritic qualities. It may be used for treatment of itch, stinging or burning pain resulting from insect bites, allergic reactions, mild sunburn and various other skin diseases.

Instructions for use:
Shake the lotion before use.
Calamine lotion should be painted onto the skin, for example with a brush. The lotion should then be allowed to dry. It should not be covered with wrappings or bandages.

! Precautions:

Calamine lotion should only be used on wounds with caution because of the risk of absorption of phenol. Avoid contact of calamine lotion with the eyes.

2.4. Chlorhexidine Diacetate Solution 1% / Chlorhexidine Digluconate Sol. 1%

chlorhexidine diacetate	1,0g
water	to 100ml
chlorhexidine digluconate stock solution 20%	5,0ml
water	to 100ml

← Formulation

Procedure:

Chlorhexidine diacetate solution 1%:

1. Heat 120ml water to the boil and allow to cool. Use this water for the preparation.
2. Dissolve the chlorhexidine diacetate in approximately 80ml of this water and mix.
3. Check if all the chlorhexidine has dissolved.
4. Allow to cool completely.
5. Add enough recently boiled and cooled water to produce 100ml and mix well.

Chlorhexidine digluconate solution 1%:

1. Heat 120ml water to the boil and allow to cool. Use this water for the procedure.
2. Mix the chlorhexidine stock solution with approximately 80ml of this water.
3. Add enough recently boiled and cooled water to produce 100ml and mix well.

These two solutions are interchangeable according to the availability of either the diacetate or the digluconate form.
Chlorhexidine solutions should preferably be stored in a cool and dark place.
Chlorhexidine solution 1% should preferably be used within 2 days. Sterilized solutions should preferably be used within 2 days after the first opening.
Alcohol (industrial methylated spirit) in a concentration of more than 7% can be used to prevent growth of resistant organisms in the solution. For adequate protection, add 10ml of 95% industrial methylated spirit to every 90ml of chlorhexidine solution.
Unopened sterilized solutions and solutions which contain at least 7% alcohol may be kept in store. These should preferably be used within 3 months.

Indications:
Chlorhexidine diacetate / digluconate solution 1% is used for the disinfection of intact skin, for example prior to surgical procedures. For the disinfection of wounds, a diluted solution (0,1%) is preferred. Chlorhexidine is not active against bacterial spores and viruses, but iodine is. Therefore, iodine preparations are often preferred.

Disinfection of wounds:
Clean the wound carefully. Chlorhexidine is inactivated by wound debris and blood.
Apply the solution (0,1%) to the wound.
A 0,1% solution can be prepared by diluting a 1% solution 1 in 10 with recently boiled and cooled water.

! Precaution:

Chlorhexidine solutions 1% should not come into contact with the eyes, because they are very irritating. If such a contact has occurred accidentally, rinse immediately with a lot of water.

2.5. Clotrimazole Cream 1%

Formulation →

clotrimazole	1,0g
basic cream	99,0g

Procedure:
1. Triturate the clotrimazole carefully with about 1 g of basic cream until completely homogeneous.
2. Add the rest of the basic cream gradually and mix until completely homogeneous.

Indications:
As an antifungal used topically in superficial candidiasis, and in the skin infections pityriasis versicolor and dermatophytosis. Clotrimazole cream 1% is a water washable product and is suitable for use on hairy parts of the skin.

2.6. Emulsifying Ointment

Formulation →

lanette wax	30,0g
liquid paraffin	25,0g
petrolatum	45,0g

If no liquid paraffin is available the ointment can be prepared with petrolatum 70% and lanette wax 30%. This has only limited effect on consistency and stability.
Petrolatum alone may be used as a vehicle but is not water washable and very occlusive.

Procedure:
1. Melt all ingredients together over gentle heat.
2. Stir gently until cold.

Emulsifying ointment should preferably be used within 2 years. The ointment may get inhomogeneous at a temperature of 25°C and above. This does not effect the ointment, provided that it is properly mixed before dispensing or use.

Use:
Emulsifying ointment is a fatty ointment base used for various procedures. It is easily washed away with water and may be used on hairy parts of the skin. Emulsifying ointment has a mild occlusive effect and may be used as an emollient and mild moisturizer, for instance in the management of dry skin in leprosy.

2.7. Gentianviolet Solution 0,5%

gentianviolet	0,5g
water	100ml

← Formulation

Procedure:
1. Heat 120ml water to the boil and allow to cool.
2. Dissolve the gentianviolet in 100ml of this water.
3. Check for undissolved crystals on the bottom of the flask. If dissolution is incomplete, continue shaking or stirring. Gentle heat may be used.

The solution should preferably be used within 3 months. After opening, the solution is readily contaminated with microorganisms which may cause infections. Therefore, the product should not be used for more than one week after the opening.
Indications:
Gentianviolet has good antimicrobial activity against Candida species. Gentianviolet solution can be used for treatment of Candida infections of skin and mouth. Candida infections of the vagina can also be treated with gentianviolet, but other pharmaceutical forms should be chosen, for instance vaginal tablets.

Gentianviolet also has antimicrobial activity against a number of bacteria, particularly Gram positive organism. It may therefore be used as a paint once daily for ulcers, e.g. in leprosy. For severe or deep infections systemic antibiotics are needed.

Dosage:
The solution should be applied to the affected parts of the skin or the oral mucosa once or twice daily for 3 days or until the disease has markedly improved.

Instructions for use:
Apply gentianviolet solution to the affected parts of the skin only. Leave the affected parts of the skin exposed to the air. Do not cover with bandages.
Oral infections: Apply the solution to the affected parts. Avoid contact with healthy parts of the mucosa. Gentianviolet solution should not be swallowed. Children should be turned face down after application to avoid swallowing.

! Precautions:

The solution stains the skin. The staining may be permanent (tattooing). The solution should therefore not be used in the face. Undissolved gentianviolet crystals are very irritating. It is therefore important to check for complete dissolution before dispensing or use. Avoid the use of gentianviolet during pregnancy.

2.8. Hydrocortisone Cream 1%

hydrocortisone acetate	1,0g
basic cream	99,0g

← Formulation →

2.9. Hydrocortisone Ointment 1%

hydrocortisone acetate	1,0g
emulsifying ointment	99,0g

Procedure:
1. Grind the hydrocortisone acetate. If sieves are available, sieve the hydrocortisone acetate, preferably through a 90µm sieve.
2. Triturate the hydrocortisone acetate carefully with about 1 g of basic cream or emulsifying ointment until completely homogeneous.

3. Add the rest of the basic cream or emulsifying ointment gradually and mix until completely homogeneous.

Whether a **cream** or an ointment is preferred depends on the local situation. The cream should preferably be used within 3 weeks. If the cream is exposed to temperatures higher than 40°C it should be used within one week.
The **ointment** should preferably be used within 2 months. If the ointment is exposed to temperatures higher than 40°C it should be used within 2 weeks.
The **cream** may get inhomogeneous at temperatures of 40°C and above.
The **ointment** may get inhomogeneous at temperatures of 25°C and above.
Inhomogeneity does not affect the cream/the ointment, provided that it is properly mixed before dispensing or use.

Indications:
Hydrocortisone cream / ointment has general anti-inflammatory properties. It can be used for the treatment of many skin diseases, for example eczema. Treatment is only symptomatic. Hydrocortisone cream / ointment is water washable and suitable for use on hairy parts of the skin.

! Precautions:

Do not use hydrocortisone cream / ointment on infections as they may worsen.
Apply hydrocortisone cream / ointment in a thin layer.
Hydrocortisone cream / ointment should be used for prolonged periods only on doctor's advice.
Avoid contact of the hydrocortisone cream / ointment with the eyes.
Carefully evaluate the need for treatment during pregnancy and lactation.

2.10. Iodine Solution

iodine	2,0g
potassium iodide	2,5g
water	to 100ml

← Formulation →

2.11. Iodine Tincture

iodine	2,0g
potassium iodide	2,5g
industrial methylated spirit 95 %	50ml
water	to 100ml

Procedure:
Iodine solution and Iodine tincture:

! Note:

Iodine reacts with a great number of substances. Metallic or plastic utensils should not be used in the procedure of iodine solutions. Glass and earthenware are appropriate.

1. Heat a sufficient quantity of water to the boil and allow to cool. Use this water for the preparation.
2. Dissolve the potassium iodide in 5ml of water.
3. Dissolve the iodine in this solution.

Further procedure for **Iodine solution:**
Add enough recently boiled and cooled water to produce 100ml of solution.

Further procedure for **Iodine tincture:**

1. Add the industrial methylated spirit to this solution.
   Iodine forms irritating substances with acetone and other ketones. The industrial methylated spirit used for the procedure of iodine tincture should be free from acetone and other ketones.
2. Add enough recently boiled and cooled water to produce 100ml of tincture.

Iodine solution / tincture should be used within 3 months.

! Note:

Povidone-iodine should be preferred because of its better tolerance and less toxicity.

Indications:
Iodine has a strong antiseptic activity against all micro-organisms, including bacterial spores and viruses. It is used for disinfection of intact skin and of wounds. For disinfection of intact skin, iodine tincture is preferred to iodine solution, because it has a stronger and quicker action. For wound disinfection the less irritating iodine solution is preferred, a quick action is not needed in this case.

! Precautions:

Iodine treated skin should not be covered with tight or occlusive bandages, because this may result in strong irritation and blistering of the skin.

Iodine is very irritating to the eyes. After accidental contact, rinse the eyes immediately with a lot of water. Iodine is absorbed to some extent, even through intact skin. After absorption, it interferes with the thyroid function. Iodine solution/tincture should therefore be used with great care for patients with disorders of the thyroid gland (goiter etc.).

Additional information for the use during pregnancy and lactation:
Iodine passes the placenta and interferes with the thyroid function of the unborn child. Iodine preparations should therefore be avoided during pregnancy, unless there is a pressing need to use them. Iodine is excreted in breast milk and should therefore be avoided during lactation. Consider chlorhexidine as an alternative.

2.12. Permethrin Cream 5%

permethrin	5,0g
basic cream	to 100,0g

← Formulation

Procedure:
1. Triturate the permethrin carefully with about 5 g of the basic cream until completely homogeneous.
2. Add the rest of the basic cream gradually and mix until completely homogeneous.

Indications:
Permethrin cream is used for the treatment of scabies and lice.

! Precautions:

Because of the not yet completed evaluation of the toxicity, the cream should not be used for children and pregnant women. As an alternative, benzylbenzoate emulsion should be used.
It is important not to overuse permethrin cream.

2.13. Povidone-Iodine Ointment 10%

Formulation →

povidone-iodine	100,0g
macrogol 400	60,0g
macrogol 4000	25,0g
preserved water	5,0g

Procedure:

1. Mix together 12,5g of macrogol 400 and 25g of macrogol 4000 and melt over gentle heat.
2. Stir until cold.
3. Dissolve the povidone-iodine in the mixture of preserved water and approximately 7,5g of macrogol 400.
4. Add this solution to the ointment base prepared in step 1) while stirring continuously.
5. Add macrogol 400 up to 100g and mix.

Indications:
As a disinfectant and antiseptic mainly for the treatment of contaminated wounds and burns.

! Precautions:

Iodine is absorbed to some extent, even through intact skin. After absorption, it interferes with the thyroid function.. Povidone- iodine ointment 10% should therefore be used with great care for patients with disorders of the thyroid gland (goiter etc.). The application of povidone-iodine to severe burns or to large areas otherwise denuded of skin may produce the systemic adverse effects associated with iodine.

Additional information for the use during pregnancy and lactation:
Iodine passes the placenta and interferes with the thyroid function of the unborn child. Iodine preparations should therefore be avoided during pregnancy, unless there is a pressing need to use them. Iodine is excreted in breast milk and should therefore be avoided during lactation. Consider chlorhexidine as an alternative.

2.14. Povidone-Iodine Solution 10%

povidone-iodine	10,0g
disodium hydrogen phosphate dodecahydrate	3,32g
citric acid	0,84g
water	to 100ml

← Formulation

Procedure:

1. Heat approximately 120ml water to the boil and allow to cool. Use this water for the preparation.
2. Dissolve the disodium hydrogen phosphate dodecahydrate and the citric acid in approximately 60ml of the water.
3. Add the povidone-iodine in small parts gradually to this solution while stirring continuously.
4. After complete dissolution of the povidone-iodine add water up to 100ml and mix.

Indications: As a disinfectant and antiseptic mainly for the treatment of contaminated wounds and burns.

! Precautions:

Iodine is absorbed to some extent, even through intact skin. After absorption, it interferes with the thyroid function.. Povidone- iodine solution 10% should therefore be used with great care for patients with disorders of the thyroid gland (goiter etc.). The application of povidone-iodine to severe burns or to large areas otherwise denuded of skin may produce the systemic adverse effects associated with iodine.

Additional information for the use during pregnancy and lactation:
Iodine passes the placenta and interferes with the thyroid function of the unborn child. Iodine preparations should therefore be avoided during pregnancy, unless there is a pressing need to use them.

2.15. Potassium Permanganate Stock Solution 1% - stock solution – has to be diluted before use!

Formulation →

potassium permanganate	1,0g
water	100ml

Procedure:

1. Heat 120 ml of water to the boil and allow to cool. Use this water for the preparation.
2. Dissolve the potassium permanganate in 100 ml of this water.
3. Make sure that the dissolution is complete, preferably by filtering the solution. Filtering should not be done over a filter made from organic or metallic materials. Glass filters are suitable.

! Note:

The solution is rapidly inactivated by organic matter. Degradation is very much increased by the degradation products of potassium permanganate. If the stock solution is filtered over organic or metallic filters, for example over paper filters or cotton wool, it will contain degradation products. As a result of this, it will not be stable.
Potassium permanganate solution shows a dark purple colour. Degraded solutions however show a brown colour. Degradation is easily observed in diluted solutions, these should not be brownish, but pink.
Degraded solutions are less effective or even ineffective.
The solution should be packed in a dark coloured, well closed glass bottle. Bottles should bear the warning: "Do not use undiluted!"
The solution should be used within one month.

Indications:
Potassium permanganate solution has a strong antiseptic action and astringent properties, but is rapidly inactivated after application. It may be applied to the skin or it may be used in bath water.
For treatment of minor skin infections in leprosy soakings with diluted potassium permanganate solution twice daily during 10 -15 minutes can be used.

Instructions for use:
Do not use undiluted!
The solution should be freshly diluted before each use. The stock solution should be diluted with boiled and cooled water until a pink colour is obtained. Approximately the right dilution is obtained if a teaspoon full of stock solution is added to about 300 ml of water.
Wash the skin with water and soap and dry. Wet the skin frequently with diluted solution during 10 minutes. Potassium permanganate solution is rapidly inactivated so it should be reapplied often during 10 minutes of treatment time. Rinse the skin thoroughly with water and dry. Discard the rest of the diluted solution.

! Precautions:

Potassium permanganate crystals and strong solutions are very irritating and can cause severe chemical burns. Potassium permanganate dissolves very slowly in water. Therefore crystals should never be dispensed to patients. In some countries tablets for dissolution are marketed. Such tablets should not be given to patients as they may take them orally.

2.16. Whitfield's Cream (modified)

benzoic acid	5,0g
salicylic acid	5,0g
basic cream	90,0g

← Formulation →

2.17. Whitfield's Ointment (modified)

benzoic acid	5,0g
salicylic acid	5,0g
emulsifying ointment	90,0g

These formulas differ from that of the Whitfield preparations generally used in Anglo-Saxon countries. The latter contain 6% benzoic acid and 3% salicylic acid. The 5/5% formulation may be slightly more active.
The cream is less hydrating than the ointment and should be preferred.

Procedure:
1. Grind the benzoic acid and the salicylic acid separately in a mortar. If sieves are available, sieve the benzoic acid and the salicylic acid, preferably through a 90 µm sieve.
2. Mix the benzoic acid with the salicylic acid.

3. Triturate this mixture with approximately 10 g of basic cream or emulsifying ointment.
4. Add the rest of the basic cream or the emulsifying ointment gradually and mix until completely homogeneous.

The cream should preferably be used within 3 months. The cream may get inhomogeneous at temperatures of 40°C and above.
The ointment should preferably be used within 2 years. The ointment may get inhomogeneous at temperatures of 25°C and above.
Inhomogeneity does not affect the cream / the ointment, provided that it is properly mixed before dispensing or use.

Indications:
Whitfield's cream / ointment combines a fungistatic activity with keratolytic properties. It is useful for treating superficial skin infections caused by fungi, such as ringworm and athlete's foot. Candida species are not sensitive. Whitfield's cream / ointment should only be applied to affected parts of the skin.

! Precautions:

In small children, do not use the cream on large parts of the body or for prolonged periods of time. Apply Whitfield's cream / ointment in a thin layer. Excessively thick layers have occlusive and hydrating properties, which may cause infections and exacerbation of the skin disease.

3. Antiseptics and Disinfectants[4]

No medical institution is able to work properly without these two preparation groups. Therefore, they are briefly mentioned in this booklet. It is not possible to state them all because of the abundance of antiseptics and disinfectants. Therefore, only the most important are mentioned, especially with regard to HIV activity.

3.1. Some notes on particular products

E t h a n o l and i s o p r o p a n o l
Good disinfectants for objects or intact skin (more effective at 60-70% than at 90-95%). They are not applicable for wounds because they are painful and slow down the healing process. They are expensive both to buy and to transport (they require special packing for air transport –„Dangerous Goods"). Moreover, the purchase, transport and importation of ethanol often require complicated administrative procedures.

C h l o r o x y l e n o l (Dettol™)
An efficient but expensive product which can be used as an antiseptic (0,25% chloroxylenol solution) and disinfectant ("soapy solution of cresol"). Can be of interest if locally available.

E o s i n
Antiseptic with limited effectiveness, but useful as a drying agent. Its aqueous solutions are easily contaminated by pathogenic bacteria. Can be replaced by gentian violet.

H y d r o g e n p e r o x i d e
Very useful for certain indications (e.g. dirty wounds), but very hard to preserve in diluted and ready-to-use form. Concentrated hydrogen peroxide is dangerous to transport and to handle.

H e x a c h l o r o p h e n e
Antiseptic with limited effectiveness and toxic for the central nervous system. Usage not advised.

[4] The data of this chapter were taken from „Essential Drugs-Practical Guidelines", MSF 1993

Mercury derivates (phenyl mercuric salts, thiomersal, mercurochrome)
Antiseptics with limited effectiveness in aqueous solutions. Toxic for the kidneys and the central nervous system, often cause allergies and harmful to the environment. **Forbid their use!**

Ether
Often wrongly used as an antiseptic. It has no disinfecting qualities, but degreases the skin and removes sticky residues of elastoplast and similar dressings.

Important additional information:

- To avoid a microbial contamination of the aqueous preparations, only drinking water, filtered water or boiled water should be used.
- Destroy all aqueous solutions after one week at the latest. Therefore, only prepare small quantities at a time. Note the expiry date on the container.
- Never mix fresh solutions with older ones!
- Do not use a cork. The label should bear at least name and concentration of the solution as well as the expiry date or the manufacturing date.

3.2 Disinfection of material

Soak the clean material for 15 minutes in one of the disinfectant solution indicated below. This gives a very effective disinfection for bacteria in vegetative forms and for viruses (including the HIV viruses and hepatitis B virus). However, the bacterial spores are not destroyed (e.g. tetanus spores). Sterilization (elimination of all bacteria, including the spores) can only be obtained with an autoclave or a good electric hot air sterilizer. Sterilization is obligatory for all materials that come in contact with sterile parts of the body (equipment for surgery, injections and similar procedures). Soaking in strong disinfectant solutions can sometimes be an alternative to sterilization when the latter is impossible. However, in that case, boiling is still the best approach. Chemical disinfection is never recommended for sterilizing syringes and needles!

3.3. Short overall view of HIV-effective disinfectants (according to WHO)

Disinfectants	Recommended concentration	Preparation:
Chlorinated lime (Calcium hypochlorite) or NaDCC (sodium dichloroiso-cyanurate)[1]	0,1%active chlorine	The amount of active chlorine must always be checked on the packaging of the product.
Chloramine T Tosylchloramide sodium	2%	20 g/litre
Povidone iodine	2,5%	1 part of 10% solution + 3 parts of water
Ethanol	70%	8 parts of ethanol 90% + 2 parts of water
Isopropanol	70%	7 parts of isopropanol 100% + 3 parts of water

3.4. Cleaning of dirty equipment

Reusable equipment must be carefully cleaned before sterilization.
The material should be soaked in water immediately after use, otherwise dirty parts will dry.
Half an hour before cleaning the equipment, a disinfectant should be added to this water for an initial decontamination (e.g. chloramine 20g/litre, Lysol 50g/litre).
Soaking for too long or with too high a concentration of disinfectant can cause corrosion of metal instruments.
After cleaning, the equipment must be carefully rinsed with water and then dried.

[1] These solutions oxidize metals; therefore use only stainless steel containers of good quality.

4. Miscellaneous

4.1. Ultrasound Jelly

Formulation →

carbomer 980	4,0g
water	836ml
euxyl K 400	1,0g
glycerol 85 %	150,0g
sodium hydroxyde 15 %*	9,0g

Procedure:

1. Mix euxyl K 400 and water.
2. Spread equal amounts of carbomer 980 in small quantities on this mixture while stirring.
3. Cover the mixture and leave overnight.
4. Next day add in succession glycerol while stirring slowly in this mixture.
5. Wait until there are no more visible air bubbles in the mixture. Add slowly the sodium hydroxide solution while stirring slowly and carefully. Avoid to produce air bubbles (especially small ones).

Packaging:
Should be packed in a tight closing container. Protect from direct sunlight.

*Preparation of sodium hydroxide 15 % solution:

sodium hydroxide 15,0g water to 100,0g

← Formulation

1. Dissolve the sodium hydroxide in approx. 60ml of water very carefully. Attention: the solution becomes hot!
2. Add water up to 100 g and mix.

! Precautions

Sodium hydroxide is very corrosive. Avoid any contact with the skin and the eyes!

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